

CLAIMS

What is claimed is:

1. A force sensing transducer which comprises:
a ringlike load carrying component with a force transmitting segment which moves as an external force is applied to said component;
crossbeam means located in a hollow in the load carrying component, said crossbeam means being deflectable by the application of a force to the load carrying component and the consequent movement of the force transmitting segment of the load carrying component;
and
a force sensing means mounted in said hollow between a segment of said load carrying component and said crossbeam means.
2. A transducer as defined in claim 1 in which said sensing means is in direct contact with said crossbeam means.
3. A transducer as defined in claim 1 in which said crossbeam means is preloaded and trapped between said crossbeam means and said load carrying component.
4. A transducer as defined in claim 1 in which the crossbeam means has at least one segment configured to increase the compliance of said crossbeam means.
5. A transducer as defined in claim 1 in which the force transmitting segment and the crossbeam are so related as to preload the sensing means.
6. A force sensing transducer which comprises a ringlike component having caging means which keeps excessive stresses from being applied to said sensing means.
7. A transducer as defined in claim 2 in which said crossbeam has arms which are angled from the normal toward the force transmitting segment of the load carrying

component to alter the ratio of the force-associated strains in said component and said sensing means.

8. A transducer as defined in claim 2 in which said load carrying component and said crossbeam means are integral components of said transducer.

9. A transducer as defined in claim 2 in which: the load carrying component has force transmitting components located on opposite sides of said crossbeam means.

10. A transducer as defined in claim 8 which has a force sensing means mounted between said crossbeam means and each of said force transmitting segments.

11. A force sensing device as defined in claim 9 in which one of said sensing means is responsive to a force applied to the transducer and the other of said sensing means is a reference means.

12. A force sensing device as defined in claim 9 in which a first and second of said sensing means are respectively responsive to movement of first and second ones of said force transmitting segments to generate a signal indicative of the magnitude of a force applied to said transducer.

13. A transducer as defined in claim 2 which said load carrying component has integral, hollow, inner and outer elements, wherein said sensing means is mounted in said inner element, and wherein the ends of the crossbeams are joined to said inner element on opposite sides of that element.

14. A force transducer as defined in claim 12 in which said inner element has segments which are compliant along the path of displacement of said force transmitting segments and thereby allow the force transmitted by those segments to the sensing means to be increased while keeping the stresses in said crossbeam mean within acceptable limits.

15. A transducer as defined in claim 12 which has an integral, hollow, intermediate element between said inner and outer elements.

16. A transducer as defined in claim 1 in which the load carrying component is so constructed and configured as to keep excessive forces from being transmitted to the force sensing means.

17. A transducer as defined in claim 1 in which said sensing means comprise at least one vibrating crystal.

18. A transducer as defined in claim 1 in which said load carrying component has at least one hingelike segment for increasing the compliance of said component.

19. A force sensing transducer which comprises:
a frame which includes a ringlike load carrying component with a force transmitting segment which moves as force is applied to said component;
crossbeam means mounted in a hollow in the load carrying component, said crossbeam means being deflectable by the application of a force to said load carrying component; and
a preloaded force sensing means so mounted in the hollow of said load carrying component relative to said crossbeam means that deflection of said crossbeam imposes a signal generating strain on said sensing means.

20. A transducer as defined in claim 19 in which said force sensing means is preloaded and retained in the hollow of said load by said crossbeam means.